

# Postgraduate Certificate

## Hydrogen Production and Electrolysis



## Postgraduate Certificate Hydrogen Production and Electrolysis

- » Modality: online
- » Duration: 6 weeks
- » Certificate: TECH Technological University
- » Dedication: 16h/week
- » Schedule: at your own pace
- » Exams: online

Website: [www.techtute.com/us/engineering/postgraduate-certificate/hydrogen-production-electrolysis](http://www.techtute.com/us/engineering/postgraduate-certificate/hydrogen-production-electrolysis)

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01

# Introduction

Due to the energy transition process currently underway, large companies in productive industrial sectors are promoting electrolysis processes as an optimal alternative for the generation of green hydrogen. The main advantage of this option is the absence of carbon emissions to the atmosphere, so the current investment is in the development of hydrogen production and electrolysis. In this line, TECH provides, through this degree, the most advanced and necessary knowledge to progress in an expanding sector. This will be possible thanks to the quality multimedia content, offered in a 100% online format by a team of experts with wide experience in the sector.



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*This 100% online Postgraduate Certificate gives you the keys to develop successful projects that produce hydrogen"*

Although hydrogen can be extracted from fossil fuels, biomass, can be generated from water or by mixing the above components, companies currently produce it from natural gas. However, the pressing need to reduce carbonization and CO2 emissions to the atmosphere has led to increased investment in projects that rely on electrolysis processes as an alternative for green hydrogen generation. And although this development is still residual compared to other energy options, it will gain momentum in the medium and long term.

An emerging market today, where scientists continue to discover multiple properties of hydrogen, expanding the options for extending fuel cell lifetime or refining their development. Given this reality, this academic institution has decided to create this Postgraduate Certificate in Hydrogen Production and Electrolysis, which contains the most outstanding and advanced information in this field.

Therefore, through a syllabus with a theoretical-practical approach, students will acquire the knowledge that will lead them to advance professionally in a booming sector. This will be possible, in addition, thanks to the multiple pedagogical tools provided by TECH which have been developed using the latest technology applied to teaching.

In this way, the graduate will learn about hydrogen production methods in development phase, electrochemistry, cell assembly to form the stack and its peripherals. In addition, this program will provide you with the necessary resources for the study and modeling of the operation of the whole, which make up the electrolysis.

The professional is then, before a Postgraduate Certificate 100% online, which can be done comfortably at any time of the day, and which can be accessed from any electronic device (computer, *tablet* or mobile) with internet connection. A degree that is in line with the present times and provides the flexibility that people need to be able to combine their personal responsibilities with high-level education.

This **Postgraduate Certificate in Hydrogen Production and Electrolysis** contains the most complete and up-to-date program on the market. The most important features include:

- ◆ The development of practical cases presented by Engineering experts
- ◆ The graphic, schematic and eminently practical contents with which it is conceived provide technical and practical information on those disciplines that are essential for professional practice
- ◆ Practical exercises where the self-assessment process can be used to improve learning
- ◆ Its special emphasis on innovative methodologies
- ◆ Theoretical lessons, questions to the expert, discussion forums on controversial issues, and individual reflection tasks
- ◆ The availability of access to content from any fixed or portable device with an Internet connection



*To access this advanced syllabus you only need an electronic device with an internet connection"*

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*Enroll now in a Postgraduate Certificate that makes it easy for you to understand electrolysis technology through innovative learning resources”*

The program includes, in its teaching staff, professionals from the sector who bring to this program the experience of their work, as well as renowned specialists from reference societies and prestigious universities.

Its multimedia content, developed with the latest educational technology, will allow the professional a situated and contextual learning, that is, a simulated environment that will provide an immersive learning programmed to train in real situations.

The design of this program focuses on Problem Based Learning, by which the professional must try to solve the different professional practice situations that arise during the academic year. For this purpose, they will be assisted by an innovative interactive video system created by renowned experts.

*With this degree you will have no mandatory classes and will have 24 hours a day access to the most advanced content on Hydrogen Production and Electrolysis.*

*You will acquire the knowledge needed to be able to model the operation of an electrolyzer.*



# 02

# Objectives

The syllabus of this Postgraduate Certificate has been designed to offer in only 6 weeks, the essential information for the engineering professional to be able to develop a differentiated knowledge of each of the processes necessary for hydrogen formation, as well as the modeling of the operation of an electrolyzer. To achieve this, the teaching team provides case simulations that will bring you closer to the techniques and methods that you will be able to apply in your daily work.







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*In only 6 weeks you will obtain a quality Postgraduate Certificate, which will lead you to develop an advanced knowledge of hydrogen formation processes"*



### General objectives

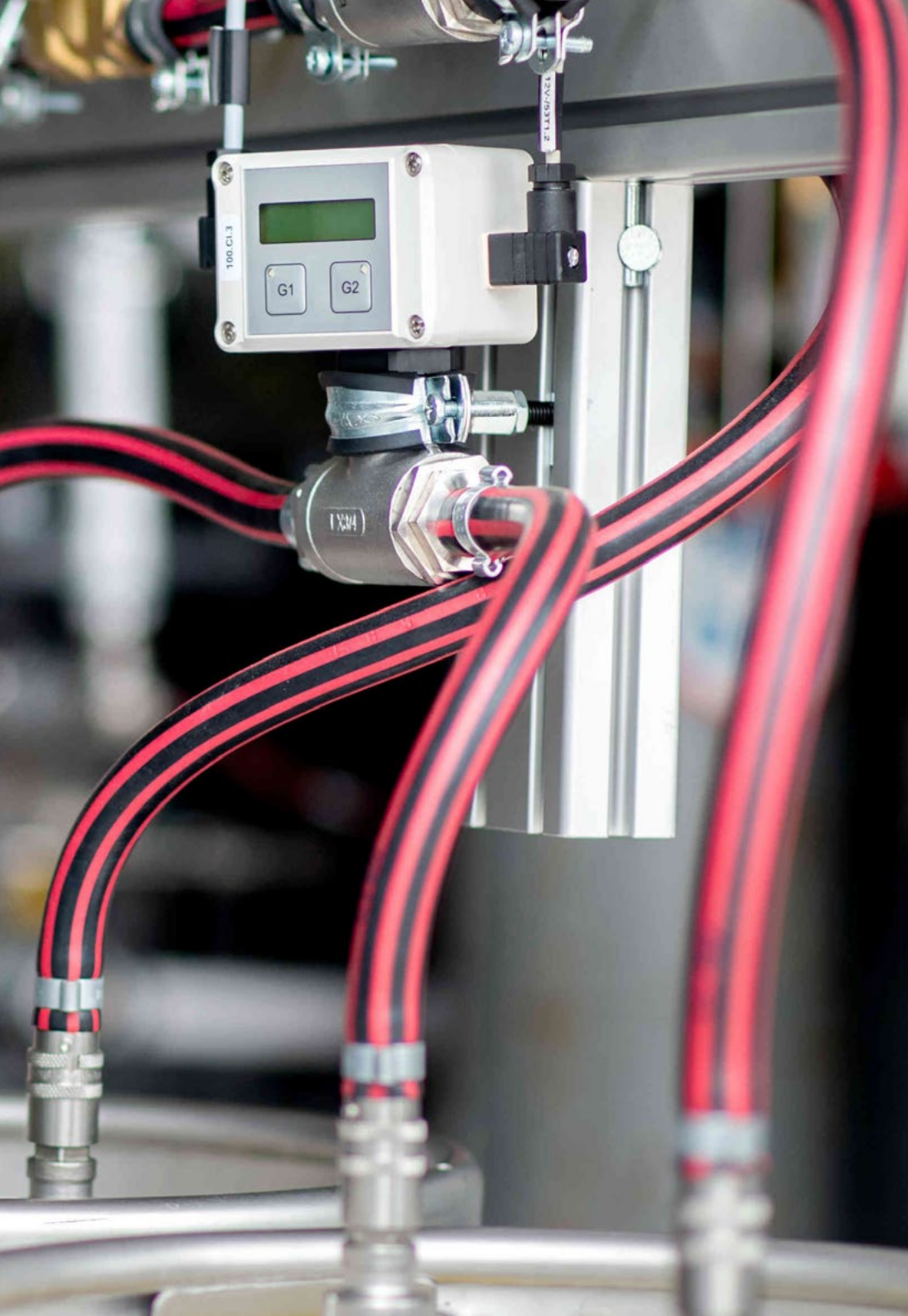
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- ◆ To develop differentiated knowledge of all Hydrogen formation processes
- ◆ To generate specialized knowledge on the understanding of electrolysis technology
- ◆ To enable students to model the electrolyzer operation

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*You will be able to deepen with this program in the methods of hydrogen production from fossil fuels and biomass”*





## Specific objectives

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- ◆ To determine the methods of hydrogen production from fossil fuels
- ◆ To analyze the mechanisms of hydrogen generation from biomass
- ◆ To establish the modes of hydrogen biological formation
- ◆ To differentiate the different electrolysis technologies for hydrogen production
- ◆ To examine the electrochemistry behind the electrolysis processes
- ◆ To design the complete electrolysis system
- ◆ To carry out a techno-economic modeling of an electrolysis system

# 03

## Structure and content

The syllabus of this Postgraduate Certificate has been created in order to offer the students, in 150 teaching hours, the most relevant information about Hydrogen Production and Electrolysis. For this purpose, the graduate will be provided with video summaries, detailed videos, specialized readings and case study simulations, which will lead them to delve into the most important aspects of biomass generation, electrolysis, stack or techno-economic modeling. In addition, thanks to the Relearning method, used by TECH, you will reduce the study and memorization hours.





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*To access this advanced syllabus you only need an electronic device with an internet connection”*

## Module 1. Hydrogen Production and Electrolysis

- 1.1. Production through fossil fuels
  - 1.1.1. Production by reforming of hydrocarbons
  - 1.1.2. Generation by pyrolysis
  - 1.1.3. Coal Gasification
- 1.2. Production from Biomass
  - 1.2.1. Hydrogen Production by Biomass Gasification
  - 1.2.2. Hydrogen Generation by Biomass Pyrolysis
  - 1.2.3. Water reforming
- 1.3. Biological Production
  - 1.3.1. Water gas shift (WGS)
  - 1.3.2. Dark fermentation for biohydrogen generation
  - 1.3.3. Photofermentation of organic compounds for hydrogen production
- 1.4. Chemical Process By-Product
  - 1.4.1. Hydrogen as a by-product of petrochemical processes
  - 1.4.2. Hydrogen as a by-product of caustic soda and chlorine production
  - 1.4.3. Synthesis gas as a by-product generated in coke ovens
- 1.5. Water Separation
  - 1.5.1. Photolytic Hydrogen Formation
  - 1.5.2. Hydrogen generation by photocatalysis
  - 1.5.3. Hydrogen Production by Thermal Water Separation
- 1.6. Electrolysis: Future of Hydrogen Generation
  - 1.6.1. Hydrogen generation by photocatalysis
  - 1.6.2. Oxidation-reduction reaction
  - 1.6.3. Thermodynamics in electrolysis
- 1.7. Electrolysis Technologies
  - 1.7.1. Low temperature electrolysis: Alkaline and anionic technology
  - 1.7.2. Low temperature electrolysis: EMP
  - 1.7.3. High temperature electrolysis





- 1.8. Stack: the heart of an Electrolyzer
  - 1.8.1. Materials and components in low temperature electrolysis
  - 1.8.2. Materials and components in High temperature electrolysis
  - 1.8.3. Stack assembly in electrolysis
- 1.9. Balance of Plant and System
  - 1.9.1. Balance of Plant Components
  - 1.9.2. Balance of Plant Design
  - 1.9.3. Balance of Plant Optimization
- 1.10. Technical and Economic Characterization of Electrolyzers
  - 1.10.1. Capital and operational costs
  - 1.10.2. Technical characterization of the electrolyzer operation
  - 1.10.3. Techno-economic modeling

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*An academic option perfectly compatible with your professional and personal responsibilities”*

# 04

# Methodology

This academic program offers students a different way of learning. Our methodology uses a cyclical learning approach: **Relearning**.

This teaching system is used, for example, in the most prestigious medical schools in the world, and major publications such as the **New England Journal of Medicine** have considered it to be one of the most effective.







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*Discover Relearning, a system that abandons conventional linear learning, to take you through cyclical teaching systems: a way of learning that has proven to be extremely effective, especially in subjects that require memorization"*

## Case Study to contextualize all content

Our program offers a revolutionary approach to developing skills and knowledge. Our goal is to strengthen skills in a changing, competitive, and highly demanding environment.

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*At TECH, you will experience a learning methodology that is shaking the foundations of traditional universities around the world”*



*You will have access to a learning system based on repetition, with natural and progressive teaching throughout the entire syllabus.*



*The student will learn to solve complex situations in real business environments through collaborative activities and real cases.*

### A learning method that is different and innovative

This TECH program is an intensive educational program, created from scratch, which presents the most demanding challenges and decisions in this field, both nationally and internationally. This methodology promotes personal and professional growth, representing a significant step towards success. The case method, a technique that lays the foundation for this content, ensures that the most current economic, social and professional reality is taken into account.

“*Our program prepares you to face new challenges in uncertain environments and achieve success in your career”*

The case method is the most widely used learning system in the best faculties in the world. The case method was developed in 1912 so that law students would not only learn the law based on theoretical content. It consisted of presenting students with real-life, complex situations for them to make informed decisions and value judgments on how to resolve them. In 1924, Harvard adopted it as a standard teaching method.

What should a professional do in a given situation? This is the question that you are presented with in the case method, an action-oriented learning method. Throughout the program, the studies will be presented with multiple real cases. They will have to combine all their knowledge and research, and argue and defend their ideas and decisions.

## Relearning Methodology

TECH effectively combines the Case Study methodology with a 100% online learning system based on repetition, which combines 8 different teaching elements in each lesson.

We enhance the Case Study with the best 100% online teaching method: Relearning.

*In 2019, we obtained the best learning results of all online universities in the world.*

At TECH, you will learn using a cutting-edge methodology designed to train the executives of the future. This method, at the forefront of international teaching, is called Relearning.

Our university is the only one in the world authorized to employ this successful method. In 2019, we managed to improve our students' overall satisfaction levels (teaching quality, quality of materials, course structure, objectives...) based on the best online university indicators.



In our program, learning is not a linear process, but rather a spiral (learn, unlearn, forget, and re-learn). Therefore, we combine each of these elements concentrically.

This methodology has trained more than 650,000 university graduates with unprecedented success in fields as diverse as biochemistry, genetics, surgery, international law, management skills, sports science, philosophy, law, engineering, journalism, history, and financial markets and instruments. All this in a highly demanding environment, where the students have a strong socio-economic profile and an average age of 43.5 years.

*Relearning will allow you to learn with less effort and better performance, involving you more in your training, developing a critical mindset, defending arguments, and contrasting opinions: a direct equation for success.*

From the latest scientific evidence in the field of neuroscience, not only do we know how to organize information, ideas, images and memories, but we know that the place and context where we have learned something is fundamental for us to be able to remember it and store it in the hippocampus, to retain it in our long-term memory.

In this way, and in what is called neurocognitive context-dependent e-learning, the different elements in our program are connected to the context where the individual carries out their professional activity.



This program offers the best educational material, prepared with professionals in mind:



### Study Material

All teaching material is produced by the specialists who teach the course, specifically for the course, so that the teaching content is highly specific and precise.

These contents are then applied to the audiovisual format, to create the TECH online working method. All this, with the latest techniques that offer high quality pieces in each and every one of the materials that are made available to the student.



### Classes

There is scientific evidence suggesting that observing third-party experts can be useful.

Learning from an Expert strengthens knowledge and memory, and generates confidence in future difficult decisions.



### Practising Skills and Abilities

They will carry out activities to develop specific skills and abilities in each subject area. Exercises and activities to acquire and develop the skills and abilities that a specialist needs to develop in the context of the globalization that we are experiencing.



### Additional Reading

Recent articles, consensus documents and international guidelines, among others. In TECH's virtual library, students will have access to everything they need to complete their course.





#### Case Studies

Students will complete a selection of the best case studies chosen specifically for this program. Cases that are presented, analyzed, and supervised by the best specialists in the world.



#### Interactive Summaries

The TECH team presents the contents attractively and dynamically in multimedia lessons that include audio, videos, images, diagrams, and concept maps in order to reinforce knowledge.

This exclusive educational system for presenting multimedia content was awarded by Microsoft as a "European Success Story".



#### Testing & Retesting

We periodically evaluate and re-evaluate students' knowledge throughout the program, through assessment and self-assessment activities and exercises, so that they can see how they are achieving their goals.



# 05 Certificate

The Postgraduate Certificate in Hydrogen Production and Electrolysis guarantees students, in addition to the most rigorous and up-to-date education, access to a Postgraduate Certificate issued by TECH Technological University.





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*Successfully complete this program and receive your Postgraduate Certificate without traveling or cumbersome paperwork"*

This **Postgraduate Certificate in Hydrogen Production and Electrolysis** contains the most complete and up-to-date program on the market.

After the student has passed the assessments, they will receive their corresponding **Postgraduate Certificate** issued by **TECH Technological University** via tracked delivery\*.

The diploma issued by **TECH Technological University** will reflect the qualification obtained in the Postgraduate Certificate, and meets the requirements commonly demanded by labor exchanges, competitive examinations, and professional career evaluation committees.

Title **Postgraduate Certificate in Hydrogen Production and Electrolysis**

Official N° of hours: **150 h.**



\*Apostille Convention. In the event that the student wishes to have their paper diploma issued with an apostille, TECH EDUCATION will make the necessary arrangements to obtain it, at an additional cost.

future  
health confidence people  
education information tutors  
guarantee accreditation teaching  
institutions technology learning  
community commitment  
personalized service innovation  
knowledge present  
development languages  
virtual classroom



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